



ESRL RAPv3 and HRRR 2014

Model	Run at:	Domain	Grid Points	Grid Spacing	Vertical Levels	Pressure Top	Boundary Conditions	Initialized
RAP	GSD, NCO	North America	758 x 567	13 km	50	10 mb	GFS	Hourly (cycled)
HRRR	GSD	CONUS	1799 x 1059	3 km	50	20 mb	RAP	Hourly - RAP (no-cycle)

Model	Version	Assimilation	Radar DA	Radiation LW/SW	Microphysics	Cumulus Param	PBL	LSM
RAP	WRF-ARW v3.5.1+	GSI Hybrid 3D- VAR/Ensemble	13-km DFI	RRTMG/ RRTMG	Thompson v3.5.1	GF	MYNN	RUC 9-lev
HRRR	WRF-ARW v3.5.1+	GSI 3D-VAR/ Ensemble	3-km 15-min LH	RRTMG/ RRTMG	Thompson v3.5.1	None	MYNN	RUC 9-lev

Model	Horiz/Vert Advection	Scalar Advection	Upper-Level Damping	6 th Order Diffusion	SW Radiation Update	Land Use	MP Tend Limit	Time-Step
RAP	5 th /5 th	Positive- Definite	w-Rayleigh 0.2	Yes 0.12	20 min	MODIS Fractional	0.01 K/s	60 s
HRRR	5 th /5 th	Positive- Definite	w-Rayleigh 0.2	Yes 0.25 (flat terr)	5 min	MODIS Fractional	0.07 K/s	20 s



ESRL RAPv2 and HRRR 2013

Model	Run at:	Domain	Grid Points	Grid Spacing	Vertical Levels	Pressure Top	Boundary Conditions	Initialized
RAP	GSD, NCO	North America	758 x 567	13 km	50	10 mb	GFS	Hourly (cycled)
HRRR	GSD	CONUS	1799 x 1059	3 km	50	20 mb	RAP	Hourly - RAP (no-cycle)

Model	Version	Assimilation	Radar DA	Radiation LW/SW	Microphysics	Cumulus Param	PBL	LSM
RAP	WRF-ARW v3.4.1+	GSI Hybrid 3D- VAR/Ensemble	13-km DFI	RRTM/ Goddard	Thompson v3.4.1	G3 + Shallow	MYNN	RUC 9-lev
HRRR	WRF-ARW v3.4.1+	GSI 3D-VAR	3-km 15-min LH	RRTM/ Goddard	Thompson v3.4.1	None	MYNN	RUC 9-lev

Model	Horiz/Vert Advection	Scalar Advection	Upper-Level Damping	6 th Order Diffusion	SW Radiation Update	Land Use	MP Tend Limit	Time-Step
RAP	5 th /5 th	Positive- Definite	w-Rayleigh 0.2	Yes 0.12	10 min	MODIS Fractional	0.01 K/s	60 s
HRRR	5 th /5 th	Positive- Definite	w-Rayleigh 0.2	No	5 min	MODIS Fractional	0.07 K/s	20 s



ESRL RAPv3/HRRR-2014 Changes

	Model	Data Assimilation
RAP- ESRL (13 km)	<p>WRFv3.5.1+ incl. physics changes</p> <p>Physics changes:</p> <p>Grell-Freitas convective scheme</p> <p>MYNN PBL update - Olson version</p> <p>RUC LSM update</p> <p>Thompson microphysics – v3.5.1</p> <p>RRTMG radiation scheme</p> <p>Shallow cumulus parm w/ rad feed</p> <p>MODIS veg fraction/leaf area index</p>	<p>Merge with GSI trunk</p> <p>Increase ensemble weight in hybrid DA</p> <p>8m → 2m bkg for sfc Td assim</p> <p>Radiance bias correction</p> <p>New sat assimilation (NOAA-19, METOP-B, GOES, direct readout – RARS)</p>
HRRR (3 km)	<p>WRFv3.5.1+ incl. physics changes</p> <p>Physics changes:</p> <p>MYNN PBL update - Olson version</p> <p>RUC LSM update</p> <p>Thompson microphysics – v3.5.1</p> <p>RRTMG radiation scheme</p> <p>MODIS veg fraction/leaf area index</p> <p>Numerics changes:</p> <p>6th order diffusion in flat terrain</p> <p>Smooth terrain @lat BC</p>	<p>3-km hybrid ens/var assimilation (was var-only in 2013)</p> <p>8m → 2m bkg for sfc Td assim</p> <p>Radar LH – 4x less intense than 2013 (2x less intense than RAP but more local)</p> <p>Changes with high/medium importance for overall forecast skill</p>